

Solution Conductivity Measurements

Qualitative measurement of water purity is the major application of solution conductivity. The method provides a nonspecific test for ionic species in solution.

Principle of Technique

The conductivity of a solution is proportional to the concentration of ions in the solution. This method determines the reciprocal of conductivity, resistivity, which is a solution's specific resistance to the flow of electricity. In the conventional technique, the resistance of a sample solution is measured by immersing a pair of electrodes in the solution, imposing an AC voltage (typically 1 to 10 kHz) across the electrodes, and then measuring the magnitude of the current. The instrumentation reads conductivity directly as siemens/cm, and flow cells are available. For process monitoring, equipment can be obtained that permits electrodeless measurement of conductivity by using the effect of conductivity on the loss within the coils of a transformer.

Samples

Form. Aqueous liquid is used.

Size. A minimum of 5 mL is needed for bench-top measurements.

Preparation. Aqueous samples can be measured as received or after dilution.

Limitations

This technique is nonspecific. It is sensitive to any substance that exists in solution as ions. It gives no information about the identity of the ions and is not sensitive to substances

that do not ionize (e.g., some organic compounds). Thus, conductivity is an approximate measure of the total ionic concentration (≥ 50 ppb) of an aqueous solution.

Estimated Analysis Time

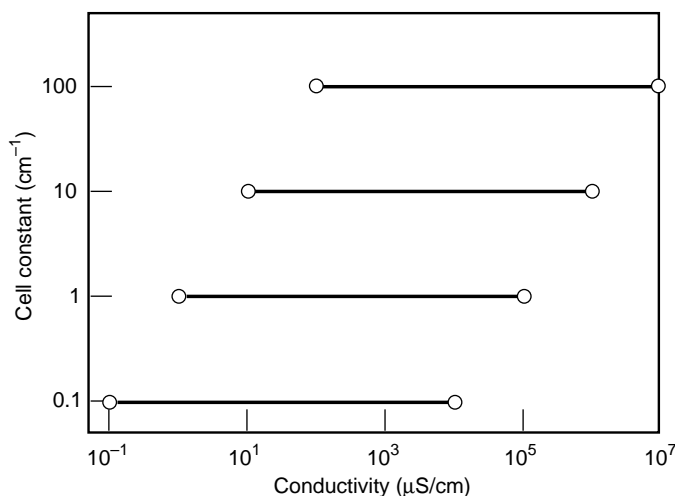
An analysis takes about 5 min per sample.

Capabilities of Related Techniques

Un-ionized organic substances can be determined using the total organic carbon analyzer. Individual ions that contribute to the conductivity can be measured using ion chromatography for anions and inductively-coupled-plasma emission spectroscopy or inductively-coupled-plasma mass spectrometry for metals.

Examples of Applications

- Qualitative characterization of ground waters.
- Characterization of products from water purification systems.
- Noninvasive monitoring of process streams.



Conductivity cells that permit a wide range of measurements are available.

